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nature

Clustering of Shaker-type K⁺ channels by interaction with a family of membrane-associated guanylate kinases.

Kim E, Niethammer M, Rothschild A, Jan YN, Sheng M.

Howard Hughes Medical Institute, Massachusetts General Hospital, Department of Neurobiology, Harvard Medical School, Boston 02114, USA.

ANCHORING of ion channels at specific subcellular sites is critical for neuronal signalling, but the mechanisms underlying channel localization and clustering are largely unknown (reviewed in ref. 1). Voltage-gated K⁺ channels are concentrated in various neuronal domains, including presynaptic terminals, nodes of Ranvier and dendrites, where they regulate local membrane excitability. Here we present functional and biochemical evidence that cell-surface clustering of Shaker-subfamily K⁺ channels is mediated by the PSD-95 family of membrane-associated putative guanylate kinases, as a result of direct binding of the carboxy-terminal cytoplasmic tails to the K⁺ channel subunits to two PDZ (also known as GLGF or DHR) domains in the PSD-95 protein. The ability of PDZ domains to function as independent modules for protein-protein interaction, and their presence in other junction-associated molecules (such as ZO-1 (ref. 3) and syntrophin), suggest that PDZ-domain-containing polypeptides may be widely involved in the organization of proteins at sites of membrane specialization.

PMID: 7477295 [PubMed - indexed for MEDLINE]

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1: *Science*. 1995 Sep 22;269(5231):1737-40.

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Domain interaction between NMDA receptor subunits and the postsynaptic density protein PSD-95.

Kornau HC, Schenker LT, Kennedy MB, Seeburg PH.

Center for Molecular Biology (ZMBH), University of Heidelberg, Germany.

The N-methyl-D-aspartate (NMDA) receptor subserves synaptic glutamate-induced transmission and plasticity in central neurons. The yeast two-hybrid system was used to show that the cytoplasmic tails of NMDA receptor subunits interact with a prominent postsynaptic density protein PSD-95. The second PDZ domain in PSD-95 binds to the seven-amino acid, COOH-terminal domain containing the terminal tSxV motif (where S is serine, X is any amino acid, and V is valine) common to NR2 subunits and certain NR1 splice forms. Transcripts encoding PSD-95 are expressed in a pattern similar to that of NMDA receptors, and the NR2B subunit co-localizes with PSD-95 in cultured rat hippocampal neurons. The interaction of these proteins may affect the plasticity of excitatory synapses.

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